Neighborhood Traffic Management Tool Kit

The following traffic calming measures constitute the standard "toolbox" of devices for neighborhood traffic management plans. The devices are divided into the following types:

- Non-Physical Measures
- Vertical Deflection Measures
- Horizontal Deflection Measures
- Narrowing Measures
- Divertive Measures

For each physical traffic calming measure in the toolbox, a description, photograph, overhead schematic, and list of advantages and disadvantages of the measure are provided.

Non-Physical Measures

Non-physical measures include speed enforcement and pavement striping/pavement legends to provide visual cues to drivers to slow down.

Targeted Speed Enforcement

Targeted speed enforcement can be conducted with police personnel or radar trailers. The locations are often selected based on received complaints. Because of limited city resources, the targeted enforcement will generally not be continued indefinitely. Targeted enforcement may also be used in conjunction with new traffic calming devices to help drivers become aware of the new restrictions.

Lane Striping

Lane striping can be used to create formal bicycle lanes, parking lanes, or simple edge lines. As a traffic calming measure, they are used to narrow the travel lanes for vehicles, to encourage drivers to lower their speeds. The past evidence on speed reductions is, however, inconclusive.

Speed Legends

Speed legends are numerals painted on roadway surfaces indicating the current speed limit. They are usually placed near speed limit signposts. Speed legends can be useful in reinforcing a reduction in speed limit between one segment of a roadway and another segment. They may also be placed at major entry points into residential areas.

Centerline or Edgeline Botts Dots/Raised Reflectors

Botts dots and raised reflectors are small raised "bump" objects, usually lining the centerline of a roadway or lane markings. They are also sometimes used to delineate the edge of the roadway. They are often used on curves where vehicles have a tendency to deviate outside of the proper lane causing a risk of head-on collisions. Raised reflectors have the added benefit of increasing the nighttime visibility of the centerline or edgeline.

Another application of Botts dots is the *rumble strip*, in which the dots are arranged in a rectangular array across one or more lanes of the roadway causing a rumbling sensation to drivers as they cross. These can reduce travel speeds but also increase roadway noise considerably.

High-Visibility Crosswalk

The "triple-four" painted crosswalk.

The ladder or zebra striped crosswalk.

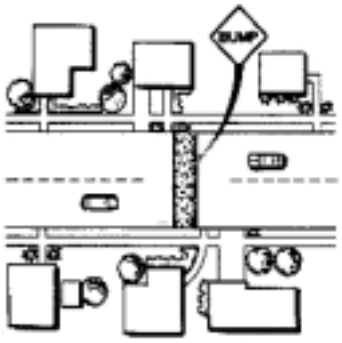
High-visibility crosswalks use special marking patterns and raised reflectors to increase the visibility of a crosswalk at night. An example is the "triple-four" marking pattern is used, in which two rows of four-foot wide rectangles, separated by four feet of unpainted space, are painted across the roadway. Raised reflectors are placed at the approach edges of these rectangles. The unpainted space along the center of the crosswalk allows wheelchairs to cross in the rain without

sliding problems across the paint. Another example is the ladder-striped crosswalk.

Vertical Deflection Devices

Vertical deflection devices use variations in pavement height and alternative paving materials to cause drivers discomfort at high travel speeds.

Speed Hump



Speed humps are rounded raised areas placed across the road. They are also referred to as road humps and undulations. They are generally 12 to 14 feet long (in the direction of travel), 3 ¼ to 3 ¾ inches high, parabolic in shape, and have a design speed of 15 to 20 mph. They are usually constructed with a taper on each side to allow unimpeded drainage between the hump and curb. Humps are typically spaced between 300 and 600 feet apart.

Approximate Cost: $3,000

Positive Effects

- Relatively inexpensive
- Relatively easy for bicyclists to cross if taper is designed appropriately
- Very effective in slowing travel speeds
- Does not require removal of on-street parking

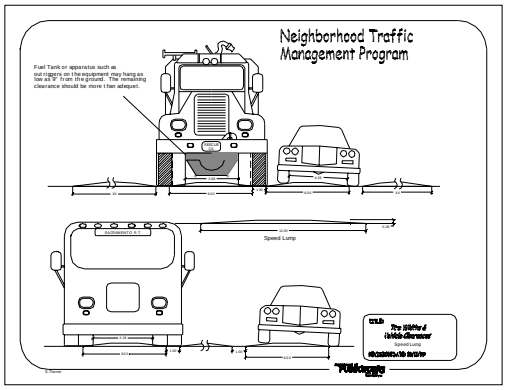
Measured Impacts		
Speed Impacts	Reduction in 85th Percentile Speeds between Slow Points	-22%
Safety Impacts	Reduction in Average Annual Number of Collisions	-11%

Source: Traffic Calming: State of the Practice, 2000.

Negative Effects

- Slows emergency vehicles, such as large vehicles that have rigid suspensions
- Increase noise to adjacent residences
- Arguably poor appearance
- Can cause a rough ride for people with certain skeletal/nerve disabilities

Speed Lump



The speed lump is a variation on the speed hump, adding two wheel cut-outs designed to allow large vehicles, such as buses and emergency vehicles, to pass without slowing. The spacing of the cut-outs is designed such that all wheels of a larger vehicle will pass through both cut-outs, but for a standard size vehicle to pass, at least one set of wheels will be affected by the hump.

Approximate Cost: $4,000.

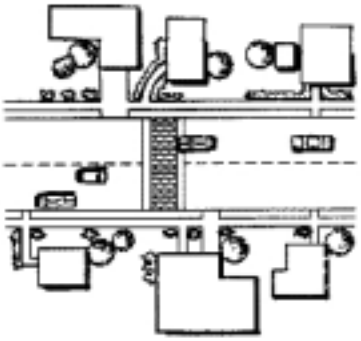
Positive Effects

- Effective in reducing speeds
- Maintains emergency response times for most vehicles
- Relatively inexpensive
- Relatively easy for bicyclists to cross if taper is designed appropriately or traffic volumes are low

Negative Effects

- Some people do not like the appearance of speed lumps
- Private vehicles with large wheel widths can avoid the lump using the wheel cut-outs
- Increased noise to adjacent residences
- Inner tires of dual-wheeled emergency vehicles may be affected

Speed Table



Speed tables are flat-topped speed humps often constructed with stamped asphalt, brick or other textured materials on the flat section. Speed tables typically include a 10-foot flat topped section. Their long flat fields, plus ramps that are sometimes more gently sloped than speed humps, give speed tables higher design speeds than humps. The brick or other textured materials improve the appearance of speed tables, draw attention to them, and may enhance safety and speed reduction.

Approximate Cost: $4,000 with basic materials.

Positive Effects

- Smoother on large vehicles (such as fire trucks) than speed humps
- Effective in reducing speeds, though not to the extent of humps

Measured Impacts		
Speed Impacts	Reduction in 85th Percentile Speeds between Slow Points	-18%
Volume Impacts	Reduction in Vehicles per Day	-12%
Safety Impacts	Reduction in Average Annual Number of Collisions	-45%

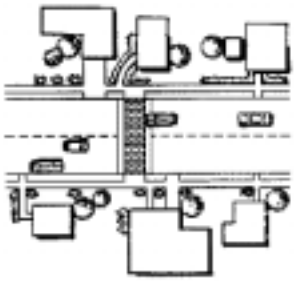
Source: Traffic Calming: State of the Practice, 2000.

Negative Effects

- Arguably poor appearance
- Textured materials, if used, can be expensive;
- Increased noise to adjacent residences

<u>Raised Crosswalk</u>

Raised crosswalks are speed tables outfitted with crosswalk markings and signage to channelize pedestrians. While a speed hump or table tapers on the sides provide unimpeded drainage, the top of a raised crosswalk is usually constructed "flush" with the top of curb to provide pedestrians with a level street crossing. By raising the level of the crossing, pedestrians are more visible to approaching motorists.



Approximate Cost: $4,500 with basic materials.

Positive Effects

- Improve safety for both vehicles and pedestrians
- If designed well, can have positive aesthetic value;
- Effective in reducing speeds, though not to the extent of speed humps

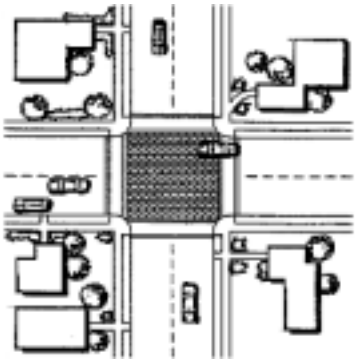
Negative Effects

- Textured materials, if used, can be expensive
- Increased noise to adjacent residences

Raised Intersection

Raised intersections are flat raised areas covering entire intersections, with ramps on all approaches and often with brick or other textured materials on the flat section. They usually rise to sidewalk level, or slightly below to provide a "lip" for the visually impaired. They make entire intersections pedestrian territory. They are particularly useful in dense urban areas, where the loss of on-street parking associated with other traffic calming measures is considered unacceptable.

Approximate Cost: $70,000.



Positive Effects

- Improves safety for both pedestrians and automobiles
- If designed well, can have positive aesthetic value
- Can calm two streets at once

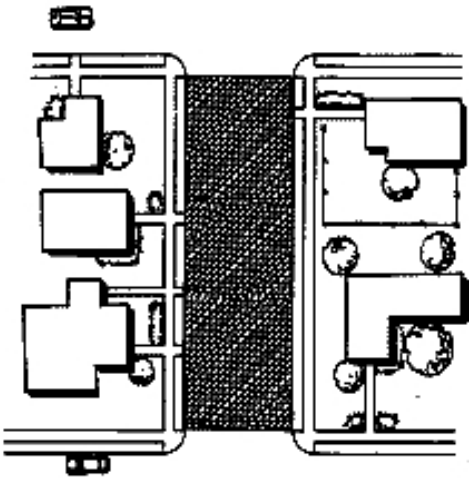
Measured Impacts		
Speed Impacts	Reduction in 85th Percentile Speeds between Slow Points	-1%

Source: Traffic Calming: State of the Practice, 2000.

Negative Effects

- Less effective in reducing vehicle speeds than speed humps and speed tables
- Expensive, varying by materials used

Textured Pavement



Textured pavement includes the use of stamped pavement or alternate paving materials to create an uneven surface for vehicles to traverse. They may be used to emphasize either an intersection or a pedestrian crossing.

Positive Effects

- Can reduce vehicle speeds over an extended length
- If designed well, can have positive aesthetic value
- Placed at an intersection, it can calm two streets at once

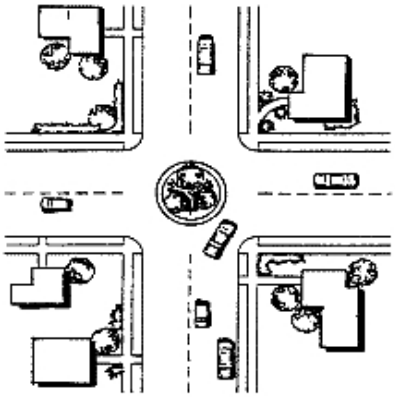
Negative Effects

- Expensive, varying by materials used
- If used on a crosswalk, can make crossing difficult for disabled users

Horizontal Deflection Devices

Horizontal deflection devices use raised islands and curb extensions to eliminate straight-line vehicle paths on roadways and through intersections.

Traffic Circle



Traffic circles are raised islands, placed in intersections, around which traffic circulates. They are usually circular in shape and landscaped in their center islands, though not always. They are typically controlled by YIELD signs on all approaches. Circles prevent drivers from speeding through intersections by impeding the straight-through movement and forcing drivers to slow down to yield. Drivers must first turn to the right, then to the left as they pass the circle, and then back to the right again after clearing the circle.

Positive Effects

- If designed well, can have positive aesthetic value
- Very effective in moderating speeds and improving safety

Measured Impacts		
Speed Impacts	Reduction in 85th Percentile Speeds between Slow Points	-11%
Volume Impacts	Reduction in Vehicles per Day	-5%
Safety Impacts	Reduction in Average Annual Number of Collisions	-51%

Source: Traffic Calming: State of the Practice, 2000.

Negative Effects

- Difficult for large vehicles (such as fire trucks) to circumnavigate
- Must be designed so that the circulating lane does not encroach on crosswalks
- Landscaping in circle must be maintained, either by City or by residents

Roundabout

Like traffic circles, roundabouts require traffic to circulate counterclockwise around a center island. But unlike circles, roundabouts are used on higher volume streets to allocate rights-of-way among competing movements. They are found primarily on arterial and collector streets, often substituting for traffic signals or all-way STOP signs. They are larger than neighborhood traffic circles and typically have raised splitter islands to channel approaching traffic to the right.

Positive Effects

- Moderates traffic speed on an arterial
- Minimizes queuing at approaches to the intersection
- Cheaper to operate than traffic signals

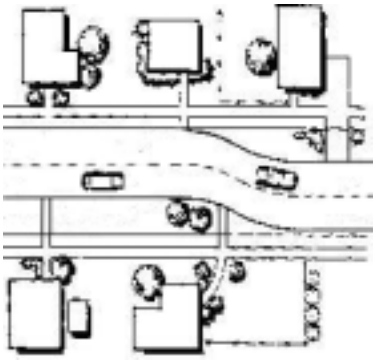
Negative Effects

- Requires major reconstruction of an existing intersection
- Increases pedestrian distance between crosswalks
- Arguably more difficult for bicyclists to negotiate

Lateral Shift

Lateral shifts are curb extensions on otherwise straight streets that cause travel lanes to bend one way and then back the other way to the original direction of travel. Lateral shifts, with the appropriate deflection, are one of the few measures that have been used on collectors or even arterials, where high traffic volumes and posted speeds preclude more abrupt measures.

Positive Effects

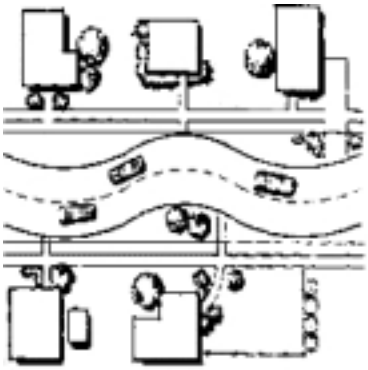


- Can accommodate higher traffic volumes than many other traffic calming measures
- Easily negotiable by large vehicles (such as fire trucks)

Negative Effects

- Not as effective reducing speeds as other measures
- Must be designed carefully to discourage encroachment into opposing travel lane

Chicane



Chicanes are curb extensions that alternate from one side of the street to the other, forming S-shaped curves. Chicanes can also be created by alternating on-street parking, either diagonal or parallel, between one side of the road and the other. Each parking bay can be created either by restriping the roadway or by installing raised, landscaping islands at each end, creating a protected parking area.

Approximate Cost: $8,000-14,000.

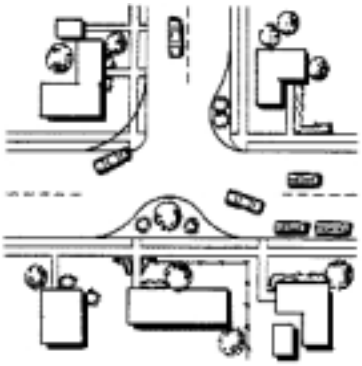
Positive Effects

- Discourages high speeds by forcing horizontal deflection
- Easily negotiable by large vehicles (such as fire trucks) except under heavy traffic conditions

Negative Effects

- Must be designed carefully to discourage drivers from deviating out of the appropriate lane
- Curb realignment and landscaping can be costly
- May require removing parking

Realigned Intersection



Realigned intersections are changes in alignment that convert T-intersections with straight approaches into curving streets that meet at right angles. A former "straight-through" movement along the top of the T becomes a turning movement. While not commonly used, they are one of the few traffic calming measures for T-intersections, because the straight top of the T makes deflection difficult to achieve, as needed for traffic circles.

Positive Effects

- Can be effective reducing speeds and improving safety at T-intersection that is commonly ignored by motorists.
- Provides additional areas for landscaping

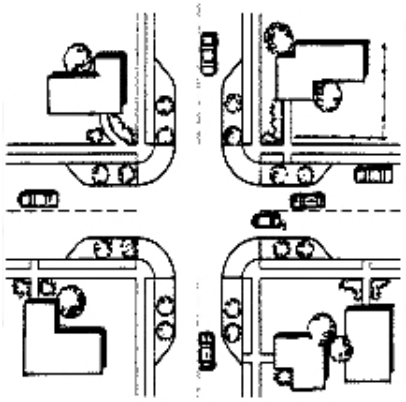
Negative Effects

- Curb realignment can be costly
- May require some additional right-of-way on the cut corner

Narrowing Devices

Narrowing devices use raised islands and curb extensions to narrow the travel lane for motorists.

Neckdown or Bulbout



Neckdowns or bulbouts are curb extensions at intersections that reduce roadway curb-to-curb width. Their primary purpose is to "pedestrianize" intersections. They do this by shortening crossing distances for pedestrians and drawing attention to pedestrians via raised peninsulas. By tightening curb radii at the corner, the pedestrian crossing distance is reduced and the speeds of turning vehicles are reduced. This increases pedestrian comfort and safety at cross streets.

Approximate Cost: $50,000-80,000 for four corners.

Positive Effects

- Improves pedestrian circulation, increases pedestrian space, and reduces pedestrian crossing distances
- Through and left-turn movements are usually easily negotiable by large vehicles (such as fire trucks)
- Creates protected on-street parking bays
- Reduces both speeds and volumes

Measured Impacts		
Speed Impacts	Reduction in 85th Percentile Speeds between Slow Points	-4%
Volume Impacts	Reduction in Vehicles per Day	-10%

Source: Traffic Calming: State of the Practice, 2000.

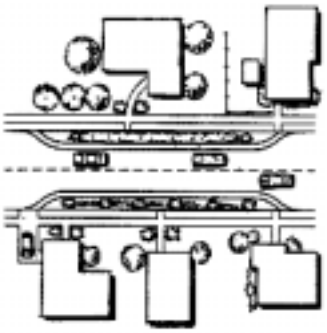
Negative Effects

- Effect on vehicle speeds is limited by the absence of any vertical or horizontal deflection
- May slow right-turning emergency vehicles somewhat and cause large vehicles to encroach into opposing lanes during turns
- May require bicyclists to briefly merge with vehicular traffic
- Can be very costly if drainage inlet modifications are required

Two-Lane Choker

Chokers are curb extensions at midblock locations that narrow a street by widening the sidewalk or planting strip. If marked as crosswalks, they are also called safe crosses. Chokers leave the street cross section with two lanes that are narrower than the normal cross section.

Approximate Cost: $7,000-10,000.



Positive Effects

- Easily negotiable by large vehicles (such as fire trucks)
- If designed well, can have positive aesthetic value
- Reduces both speeds and volumes

Measured Impacts		
Speed Impacts	Reduction in 85th Percentile Speeds between Slow Points	-4%
Volume Impacts	Reduction in Vehicles per Day	-10%

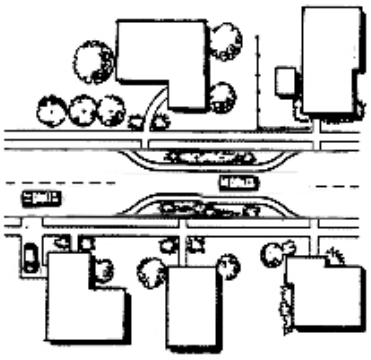
Source: Traffic Calming: State of the Practice, 2000.

Negative Effects

- Effect on vehicle speeds is limited by the absence of any vertical or horizontal deflection
- May require bicyclists to briefly merge with vehicular traffic
- Parking must be eliminated at the choker

One-Lane Choker

One-lane chokers narrow the roadway width such that there is only enough width to allow travel in one direction at a time. They operate similarly to one-lane bridges, where cars approaching on one side must wait until all traffic in the other direction has cleared, and then they proceed through the choker.



Approximate Cost: $7,000-10,000.

Positive Effects

- Maintains two-way vehicle access; and
- Very effective in reducing speeds and traffic volumes.

Measured Impacts		
Speed Impacts	Reduction in 85th Percentile Speeds between Slow Points	-14%
Volume Impacts	Reduction in Vehicles per Day	-20%

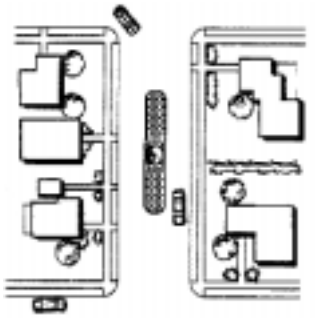
Source: Traffic Calming: State of the Practice, 2000.

Negative Effects

- Perceived by many as unsafe because opposing traffic is vying for space in a single lane
- Can only be used on low-volume roads without causing substantial congestion
- Must be designed so that it is clear to drivers that the gap is wide enough for only one direction of travel
- Parking must be eliminated at the choker

Center Island Narrowing/Pedestrian Refuge

Center island narrowings are raised islands located along the centerline of a street that narrow the travel lanes at that location. They often are landscaped to provide a visual amenity. Placed at the entrance to a neighborhood, and often combined with textured pavement, they are often called "gateways". Fitted with a gap to allow pedestrians to walk through at a crosswalk, they are often called "pedestrian refuges".



Approximate Cost: $6,000-9,000.

Positive Effects

- Increases pedestrian safety
- If designed well, can have positive aesthetic value
- Reduces traffic volumes

Measured Impacts		
Speed Impacts	Reduction in 85th Percentile Speeds between Slow Points	-4%
Volume Impacts	Reduction in Vehicles per Day	-10%

Source: Traffic Calming: State of the Practice, 2000.

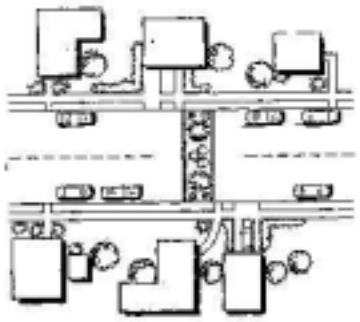
Negative Effects

- Effect on vehicle speeds is limited by the absence of any vertical or horizontal deflection
- Usually, parking must be eliminated at the narrowing

Divertive Devices

Divertive devices use raised islands and curb extensions to preclude particular vehicle movements, such as left-turn or through movements, usually at an intersection.

Full Closure



Full street closures are barriers placed across a street to close the street completely to through traffic, usually leaving only sidewalks or bicycle paths open. The barriers may consist of landscaped islands, walls, gates, side-by-side bollards, or any other obstructions that leave an opening smaller than the width of a passenger car.

Approximate Cost: $30,000-100,000.

Positive Effects

- Able to maintain pedestrian and bicycle access
- Very effective in reducing traffic volumes

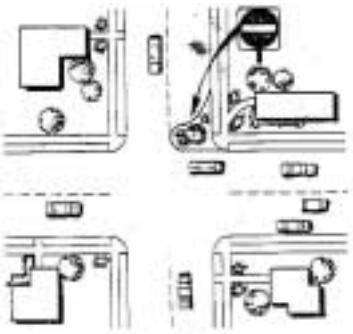
Measured Impacts		
Volume Impacts	Reduction in Vehicles per Day	-44%

Source: Traffic Calming: State of the Practice, 2000.

Negative Effects

- Requires legal procedures for public street closures
- Causes circuitous routes for local residents and emergency services
- May limit access to businesses

Half Closure



Half closures are barriers that block travel in one direction for a short distance on otherwise two-way streets. Half closures are the most common volume control measure after full street closures. Half closures are often used in sets to make travel through neighborhoods with a grid street

network circuitous rather than direct. That is, half closures are not lined up along a border, which would preclude through movement, but instead are staggered, which leaves through movement possible but less attractive than alternative routes.

Approximate Cost: $6,500.

Positive Effects

- Able to maintain two-way bicycle access
- Effective in reducing traffic volumes

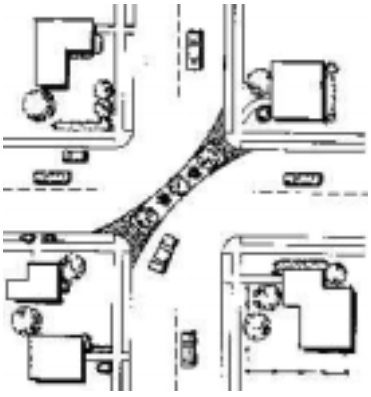
Measured Impacts		
Speed Impacts	Reduction in 85th Percentile Speeds between Slow Points	-19%
Volume Impacts	Reduction in Vehicles per Day	-42%

Source: Traffic Calming: State of the Practice, 2000.

Negative Effects

- Causes circuitous routes for local residents and emergency services
- May limit access to businesses
- If designed improperly, drivers can circumvent the barrier

Diagonal Diverter



Diagonal diverters are barriers placed diagonally across an intersection, blocking through movement. Like half closures, diagonal diverters are usually staggered to create circuitous routes through neighborhoods.

Positive Effects

- Does not require a closure per se, only a redirection of existing streets
- Able to maintain full pedestrian and bicycle access
- Reduces traffic volumes

Measured Impacts		
Speed Impacts	Reduction in 85th Percentile Speeds between Slow Points	-4%
Volume Impacts	Reduction in Vehicles per Day	-35%

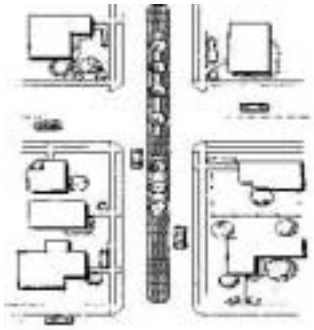
Source: Traffic Calming: State of the Practice, 2000.

Negative Effects

- Causes circuitous routes for local residents and emergency services
- May require reconstruction of corner curbs

Median Barrier

Median barriers are raised islands located along the centerline of a street and continuing through an intersection so as to block through movement at a cross street.



Approximate Cost: $15,000-20,000 per 100 feet.

Positive Effects

- Can improve safety at an intersection of a local street and a major street by prohibiting dangerous turning movements
- Can reduce traffic volumes on a cut-through route that crosses a major street

Measured Impacts		
Volume Impacts	Reduction in Vehicles per Day	-31%

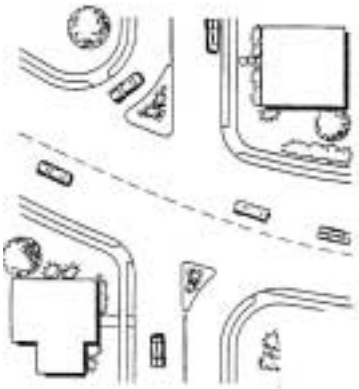
Source: Traffic Calming: State of the Practice, 2000.

Negative Effects

- Requires available street width on the major street
- Limits turns to and from the side street for local residents and emergency services

Forced-Turn Island

Forced turn islands are raised islands that block certain movements on approaches to an intersection.



Approximate Cost: $3,000-5,000.

Positive Effects

- Can improve safety at an intersection of a local street and a major street by prohibiting dangerous turning movements
- Reduces traffic volumes

Measured Impacts		
Volume Impacts	Reduction in Vehicles per Day	-31%

Source: Traffic Calming: State of the Practice, 2000.

Negative Effects

- If designed improperly, drivers can maneuver around the island to make an illegal movement
- May simply divert a traffic problem to a different street